

LANXESS - Charleston SC facility  
Ethylene Oxide (EO)  
114 Performance Testing - June 2019

Three Control Devices - all ultimately Vent to OSU Stack

Testing was performed on the following:

- Inlet and Outlet to the EO Storage Tank Scrubber (C-202)
- Inlet and Outlet of BISCEP Scrubber Train 1
- Inlet and Outlet of BISCEP Scrubber Train 3
- Outlet of OSU Stack

EO and PO Storage Tanks Vented to Scrubber C-202

Pollutant	Inlet (lb/hr)					Outlet (lb/hr)					Efficiency
	Run 1	Run 2	Run 3	Average	Max	Run 1	Run 2	Run 3	Average	Max	%
EO	25.6	3.39	24.8	17.930	25.600	1.13E-04	3.54E-06	2.58E-04	0.000125	0.000258	99.9995%
EDC	0.00428	0.000726	0.00359	0.003	0.004	1.79E-04	1.04E-05	1.99E-03	0.000726	0.001990	83.0265%
PO	0.191	0.053	0.12	0.121	0.191	1.28E-04	6.60E-06	2.77E-05	0.000054	0.000128	99.9717%
EG						8.20E-04	2.00E-05	2.45E-03	0.001097	0.002450	
VOC						1.87E-03	1.50E-04	3.08E-03	0.001700	0.003080	

Run 1 - EO unloaded from railcar through tank to reactor

Run 2 - EO unloaded to ST and ST vented to 202

Run 3 -same as 2 except also feeding to BISCEP will being unloaded

BISCEP Scrubber Train 1

Continuous one step reaction

Pollutant	Inlet (lb/hr)					Outlet (lb/hr)					Efficiency
	Run 1	Run 2	Run 3	Average	Max	Run 1	Run 2	Run 3	Average	Max	%
EO	0.616	0.698	0.732	0.682	0.732	0.441	0.459	0.478	0.459	0.478	37.2495%
EDC	0.121	0.128	0.126	0.125	0.128	0.130	0.164	0.193	0.162	0.193	-26.8229%
PO	0.038	0.05	0.035	0.041	0.050	0.023	0.021	0.020	0.021	0.023	57.5333%
EG						9.70E-02	1.46E-01	9.60E-02	0.113	0.146	
VOC						2.40E-01	2.61E-01	2.80E-01	0.260	0.280	

Biscep cycle time is 6 hours- each run encompassed all steps of productior

BISCEP Scrubber Train 3

Train 3 not in operation prior to start of runs 1 and 3. all individual steps started one at a time. Train 3 was operating a significant amount of time prior to the beginning of test run 2, thus sequence of steps was different from what was observed during runs 1 & 3

Pollutant	Inlet (lb/hr)					Outlet (lb/hr)					Efficiency
	Run 1	Run 2	Run 3	Average	Max	Run 1	Run 2	Run 3	Average	Max	%
EO	0.133	0.194	0.212	0.180	0.212	0.026	0.107	0.118	0.084	0.118	60.5346%
EDC	2.14	7.35	3.56	4.350	7.350	1.800	6.440	3.010	3.750	6.440	48.9796%
PO	0.0199	0.033	0.0286	0.027	0.033	0.003	0.015	0.018	0.012	0.018	64.4242%
EG						1.88E-02	3.24E-02	1.04E-01	0.052	0.104	
VOC						1.13E+00	3.03E+00	1.65E+00	1.934	3.031	

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2014 Baseline Emissions

Source ID	Source	Pollutant	EPA's Baseline TPY	CY 2014 submitted TPY	Revised Baseline TPY	Notes
CEEL0017	Equipment leak	Ethylene oxide	0.40001	-	0.228	LANXESS did not submit speciate fugitive data. EPA estimated a potential value Develop updated fugitives, based on actual equipment counts and speciation data. See equipment leak calculations
CEPV0007	OSU1	Ethylene oxide	0.82500	0.427	0.427	submitted 2014 data based on outlet tested emission rates from 2008 for Train 1 and Train 3 scrubber. EPA developed a potential number 2019 114 tested rate data for Train1/Train3 scrubber Outlet      0.4593 avg train 1 lb/hr outlet 0.0837 avg train 3 lb/hr outlet <u>0.543 total lb/hr EO controlled</u> 1516.11 hours of BISCEP production in 2014 0.412 TPY in 2014 if used new 2019 tested rates. Based on this the value submitted in 2014 was accurate. EPA should use 2014 submitted data
CEST0008	Storage Tank	Ethylene oxide	7.52000	0.107	0.0107	submitted 2014 data assumed 99% control of EO. EPA developed a potential value and assumed 53% control of EO 2019 114 tested rate data for EO Tank Scrubber - Scrubber actually achieved > 99.9% control Outlet      1.25E-04 total lb/hr EO controlled 1516 hours of BISCEP production in 2014 9.46E-05 TPY in 2014 if used new 2019 tested rates. Based on this the value submitted in 2014 are an over estimate of actual emissions. EPA should use 2014 submitted data and 99.9%

**LANXESS - Charleston SC facility****Production Values and Hours of Operation Estimates Used in Emission Estimates for Storage Tank C-202**Storage Tank Actual Unloading Hours of Operation for CY 2014

Railcar holds	26,000 gallons
density of EO	7.3567 lb/gal
	191,275 lbs
EO offloaded	4,949,019 lbs in 2014
Total Railcars	25.87 railcars in 2014
Unloading Time (max)	8 hours to unload a railcar
Unloaded in 2014 for	206.99 hour/yr

Storage Tank Maximum Unloading Hours of Operation

## Historic Usage of EO versus Production

	EO Usage	BISCEP production	% EO/BISCEP
2014	4,959,032	9,159,844	54.1%
2015	8,026,905	13,767,994	58.3%
2016	5,105,034	9,383,416	54.4%
2017	5,243,780	10,293,848	50.9%
		avg	54.4%

BISCEP Production (max)	52,925,000 lbs	based on 145000 lb/day
Calculated EO required	28,815,782 lbs	
Max railcars	150.65	assuming 191,275 lbs/car
Max unloading time	1205	assuming 8 hours to unload a railcar

**LANXESS - Charleston SC facility**  
**Ethylene Oxide (EO)**  
**Post Control Estimates**

**Storage Tank**

Inlet Tested Rate from 114 Testing	17.93 lb/hr
Maximum Hours	1205 hr/yr
Proposed Control	99.90%

Post Control Emissions =	21.61 lb/yr
	0.0108 TPY

**Process Vent**

Train 1 - Inlet Tested Rate from 114 Testing	0.682 lb/hr
Train 3 - Inlet Tested Rate from 114 Testing	0.180 lb/hr
TOTAL	0.862 lb/hr

Maximum Hours	8760 hr/yr
Proposed Control	99.90%

Post Control Emissions =	7.55 lb/yr
	0.0038 TPY

**Fugitives**

Baseline Estimate	0.228 TPY	
EPA's estimated Reduction for Control Option 1		44.4%

Post Control Emissions =	0.127 TPY
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